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Results from Bottom Trawl Survey on Flemish Cap of July 2011

by

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Abstract

A stratified random bottom trawl survey on Flemish Cap was carried out on July - August 2011, covering the bank up to 1460 m depth (800 fathoms). The survey was carried out on board R/V Vizconde de Eza, using a Lofoten bottom trawl gear, and 128 haul were done, 79 of them in the region with less than 730 m depth. Survey results are presented and compared with results of previous surveys in the series since 1988. Biomass and abundance indices are provided for main commercial species, as well as age composition for cod, American plaice, Greenland halibut, and roughhead grenadier.

KEYWORDS: Survey, Flemish Cap, Cod, American plaice, Redfish, Greenland halibut, roughhead grenadier.

Introduction

The survey on Flemish Cap was carried out on board R/V Vizconde de Eza. A total of 128 valid bottom trawls were made up to a depth of 1460 m (800 fathoms) (Figure 1). The survey covered adequately 31 of the 32 selected strata of the bank; only one haul was done in stratum 17. A synoptic sheet of the survey with vessel and gear characteristics is shown in Table 1. This was the 24rd survey of the series initiated by the EU in 1988. All surveys had a stratified random design following NAFO specifications (Doubleday, 1981). Dates of the previous surveys were:

Year	Vessel	Valid tows	Dates	Year	Vessel	Valid tows	Dates
1988	Cornide de Saavedra	115	8/7 – 22/7	2000	Cornide de Saavedra	120	10/7 – 28/7
1989	Cryos	116	12/7 – 1/8	2001	Cornide de Saavedra	120	3/7 – 20/7
1990	Ignat Pavlyuchenkov	113	18/7 – 6/8	2002	Cornide de Saavedra	120	30/6 – 17/7
1991	Cornide de Saavedra	117	24/6 – 11/7	2003	Vizconde de Eza	114	2/6 – 27/7
1992	Cornide de Saavedra	117	29/6 – 18/7	2004	Vizconde de Eza	124-177 ¹	25/6 – 2/8
1993	Cornide de Saavedra	101	23/6 – 8/7	2005	Vizconde de Eza	117-176	2/7 – 21/8
1994	Cornide de Saavedra	116	6/7 – 23/7	2006	Vizconde de Eza	115-179	1/7 – 26/7
1995	Cornide de Saavedra	121	2/7 – 19/7	2007	Vizconde de Eza	117-174	23/6 – 19/7
1996	Cornide de Saavedra	117	28/6 – 14/7	2008	Vizconde de Eza	110-167	21/6 – 19/7
1997	Cornide de Saavedra	117	16/7 – 1/8	2009	Vizconde de Eza	119-178	23/6 – 20/7
1998	Cornide de Saavedra	119	17/7 – 2/8	2010	Vizconde de Eza	97-153	22/6 – 21/7
1999	Cornide de Saavedra	117	2/7 – 20/7	2011	Vizconde de Eza	79-128	29/6 – 9/8

1) Up to 730 m deep (400 fathoms) – up to 1460 m deep (800 fathoms)

Previous survey report was presented by Casas and González Troncoso (2011).

As in previous years, strata 26, 27 and those in the Beothuk knoll (strata 35-39) were excluded due to previous records that indicate they were unsuitable for trawling.

Fishing was interrupted from 14 to 28 July due to mechanical breakdown, and 2-5 August to go ashore.

Results

Biomasses of main species in past surveys estimated by swept area method (tons) are:

	year	cod	American plaice	redfish	Greenland halibut	roughhead grenadier	shrimp
Strata 1-19 120-730 m	1988	40 839	16 046	188 331	6 926	2 009	5 745
	1989	114 050	14 047	162 535	4 472	871	2 298
	1990	59 362	11 983	126 757	5 799	852	3 489
	1991	40 248	10 087	76 955	8 169	1 335	11 657
	1992	26 719	8 656	130 209	8 728	1 577	25 155
	1993	60 963	7 861	72 608	6 529	3 021	12 090
	1994	26 463	8 227	162 525	8 037	1 975	3 980
	1995	9 695	6 785	87 644	10 875	1 558	7 504
	1996	9 013	4 098	119 662	11 594	1 362	10 902
	1997	9 966	3 026	165 816	16 098	1 197	7 701
	1998	4 986	3 437	70 832	24 229	1 691	41 970
	1999	2 854	2 585	98 651	21 207	1 250	25 737
	2000	3 062	1 606	177 990	16 959	1 047	19 719
	2001	2 695	2 404	77 345	13 872	2 079	28 317
	2002	2 496	2 049	121 312	12 100	1 211	40 176
	2003	1 593	2 286	93 816	6 214	2 348	21 515
	2004	4 071	3 525	250 605	12 292	3 597	20 127
	2005	5 242	2 760	453 040	11 698	2 387	30 675
	2006	12 505	1 691	766 922	11 706	3 933	15 044
	2007	23 886	1 053	464 618	13 040	1 367	17 046
	2008	43 675	1 766	566 647	11 995	2 961	11 064
	2009	75 228	1 442	358 479	7 777	782	2 758
	2010	69 295	2 446	212 211	6 657	1 402	4 894
	2011	106 151	4 084	196 493	6 841	888	1 682
32 strata 120-1460 m	2004	4 071	3 525	250 638	28 343	17 184	20 195
	2005	5 242	2 760	453 086	21 515	14 253	31 186
	2006	12 505	1 691	766 952	24 358	12 109	15 250
	2007	23 886	1 053	464 660	31 723	7 807	17 120
	2008	43 675	1 766	566 647	39 614	12 139	11 141
	2009	75 228	1 442	358 521	36 047	7 304	2 792
	2010	69 295	2 446	212 282	27 096	9 091	4 901
	2011	106 151	4 084	196 574	32 383	8 997	1 733

Values for surveys before 2003, when RV Cornide de Saavedra was used, are transformed to their equivalences for RV Vizconde de Eza following the accepted calibration among the two vessels (González Troncoso and Casas 2005). From 2004 onwards, abundances are calculated for 19 shallowest strata covering the bank up to 730 m deep, as it was done in previous years, and for 32 strata up to 1460 m deep.

Taking into account that the number of hauls done was about 2/3 of the target, the question was raised on the likeness of the current results with previous ones. Biological sampling was completed at the same level than usual, so this reduction in haul numbers only affects to those results being dependent of mean number per haul, e.g. the numbers at age. In those cases, with 2/3 of target hauls, expected variance of the results would be 3/2 higher than if full target hauls were available; the expected mean being the same. This 50% increase in variance, which is also 22% of the standard error, should be compared with the standard deviation of the variance to verify if it is inside the accepted deviation range or not. Even analytical values for the standard deviation of the variance were not available, their distribution was explored in one case study: cod abundance at age. Figure 2 shows the relationship mean-variance for numbers at age in each survey of the series since 1988. Mean and variance of the abundance at age in each survey were calculated by bootstrap at three levels: hauls, length distribution and otoliths ageing. Results indicate that the 2011 points are not out of the range of distribution of the same figures in other years, and it is interpreted as the reduction in number of hauls in 2011 did not affect the precision of estimates for cod abundance at age, used as an example.

Intermediate size haddock appears in last years in Flemish Cap as a consequence of two abundant year-classes, those of 2006 and 2007. The stock in 2011 comprised ages 4 and 5 in the rough proportion of 2/3 and 1/3 respectively. Having no new recruitments, the stock may not increase. The stock concentrates on the shallowest part of the bank, strata 1 and 2. The occurrence of these species is quite occasional. Noskov (1983) reported the occurrence of haddock from the 1980 year-class; Konstantinov *et al.* (1985) proposed it was due to the entry of eggs from the Grand Bank transported by currents.

Cod

Mean catch per towed mile by strata and its standard error are presented in Table 2. Survey biomass, as calculated by the swept area method, is compared with results of previous years by stratum in Table 4. Survey biomass is compared with Russian survey results in the following table:

Year	EU (1)	Russia: (2)	(3)	Year	EU (1)	Russia: (2)	(3)
1983		23 070		1998	4 986	-	-
1984		31 210		1999	2 854	-	-
1985		28 070		2000	3 062		-
1986		26 060		2001	2 695	784	-
1987		10 150	21 600	2002	2 496	694	-
1988	40 839	7 720	34 200	2003	1 593		-
1989	114 050	36 520	78 300	2004	4 071		
1990	59 362	3 920	15 200	2005	5 242		
1991	40 248	6 740	8 200	2006	12 505		
1992	26 719	2 490	2 400	2007	23 886		
1993	60 963	8 990	9 700	2008	43 675		
1994	26 463	-	-	2009	75 228		
1995	9 695	8 260	-	2010	69 295		
1996	9 013	730	-	2011	106 151		tons
1997	9 966	-	-				

1) Biomass estimated from bottom trawl survey.

2) Biomass estimated from bottom trawl survey (Kiseleva and Vaskov 1994; Kiseleva 1996, 1997; Vaskov and Igashov, 2003).

3) Biomass estimated of bottom trawlable plus pelagic biomass (Borovkov *et al.* 1993; Kiseleva and Vaskov 1994).

Tables 3, 5, and 6 show length distribution, the age-length key and abundance at age by stratum respectively. Distribution of survey catches is presented in Figure 3. Evolution of biomass is illustrated in Figure 4.

The abundance at age along the series is shown in Table 7. The 1992 to 2003 year-classes failed almost completely. The abundances of 2004-2008 year classes are higher than in previous 12 years. The abundance of the 2009 year-class was the highest of those in previous recent years, and the 2010 one seems to be even higher based on results at age 1 in 2011.

Figure 5 shows length distribution over the years. It illustrates the abundance of the two youngest year-classes as well the sharp reduction of mean length at age two from 2010 to 2011. Cod growth increased in those years the stock biomass was at very low level; the situation seems to be reversed now due to the recovery of the stock.

American plaice

Mean catch per towed mile by strata is presented in Table 8. Survey biomass, as calculated by the swept area method, is compared with results of previous surveys in Table 10. This biomass is compared with Russian survey results in the following table:

year	EU	Russia ¹	year	EU	Russia ¹
1983		8 900	1998	3 437	
1984		7 500	1999	2 585	
1985		7 800	2000	1 606	
1986		20 200	2001	2 404	
1987		9 300	2002	2 049	548
1988	16 046	6 500	2003	2 286	1 398
1989	14 047	5 000	2004	3 525	
1990	11 983	1 200	2005	2 760	
1991	10 087	14 400	2006	1 691	
1992	8 656	1 200	2007	1 053	
1993	7 861	2 700	2008	1 766	
1994	8 227		2009	1 442	
1995	6 785		2010	2 446	
1996	4 098		2011	4 084	tons
1997	3 026				

1) Rikhter *et al.* 1991; Borovkov *et al.* 1992, 1993, 1994; Vaskov and Igashov, 2003.

Tables 11, 12 and 13 show length distribution, the age-length key and abundances at age by stratum. Distribution of survey catches along the series is presented in Figure 6. Biomass evolution is illustrated in Figure 7.

Table 9 shows the abundance at age. Fish aged 6 or more roughly correspond with fishable biomass. Results indicate two periods for recruitment, and a change from an upper abundance level to a lower one. The 1991 year-class was the first weak cohort. The 2006 year-class is the more abundant since 1991, but its abundance is only intermediate. Recruitment for later year-classes seems to be weaker; too weak for a quick recovery of the stock.

Figure 8 shows length distribution over the years. It illustrates the lack of recruitment that occurred for many years, and how most recent year-classes are weaker than those at the beginning of the series.

Redfish

All redfish catches were classified by species. The group named *juvenile* contains those individuals of small size for which routine classification was not possible. The 15 cm maximum length is a good reference for this group, but it was never used as a criterion. The skill required to identify the species increased over the years, so the group *juvenile* was not uniform, but it is maintained for practical reasons.

Survey biomass by strata of *Sebastes marinus*, *S. mentella*, *S. fasciatus* and the *juvenile* group are presented in Table 14. Table 15 shows the total survey biomass by year in the strata up to 730 m deep (400 fathoms) and up to 1460 m, even differences are at a minimum.

For the whole bank, tables 16, 17, 18 and 19 show length distribution for the four groups. Catches per haul distribution for the three species and juveniles are presented in Figure 9. Evolution of biomass is shown in Figure 10, which illustrates the highest level since 2004 and the decline after the 2006-2008 high.

Greenland halibut

Mean catch per towed mile by strata and its standard error are presented in Table 22. Survey biomass is compared with results of previous surveys in Table 23. Catch per haul distribution is presented in Figure 11. Evolution of biomass is shown in Figure 12.

For the whole bank, length distribution, age-length keys and abundance at age are presented in Tables 24, 25 and 26, respectively. Abundance at age along the series is presented in Table 27.

Roughhead grenadier (*Macrourus berglax*)

Mean catch per towed mile by strata and its standard error are presented in Table 28. Survey biomass, as calculated by the swept area method, is compared with results of previous years by stratum in Table 29.

Tables 30, 31 and 32 show length distribution, the age-length key and abundance at age by stratum respectively. Distribution of survey catches is presented in Figure 13. Evolution of biomass is illustrated in Figure 14.

Survey biomass along this series for the 19 shallowest strata and the whole 32 strata were:

year	1-19	year	1-19	1-32
1988	2 009	2000	1 047	
1989	871	2001	2 079	
1990	852	2002	1 211	
1991	1 335	2003	2 348	
1992	1 577	2004	3 597	17 783
1993	3 021	2005	2 387	15 246
1994	1 975	2006	3 933	12 537
1995	1 558	2007	1 367	6 749
1996	1 362	2008	2 961	14 999
1997	1 197	2009	782	7 306
1998	1 691	2010	1 403	9 092
1999	1 250	2011	888	8 997

tons

Shrimp

Casas (2011) presented detailed results.

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Table 1 – Technical data of the 2011 survey.

Procedure	Specification
Vessel	R/V Vizconde de Eza
GT	1 400 t
Power	1 800 HP
Mean trawling speed	3.5 knots (3.0 knots in more than 1000 m depth)
Trawling time	30 minutes effective time
Fishing gear	type Lofoten
footrope / handrope	31.20 / 17.70 m
footgear	27 steel bobbins of 30 cm
vertical opening	3.0 m (SCANMAR)
warps	100 meters, 45 mm, 200 Kg/100m
trawl doors	polyvalent, 850 Kg
wire length	$26.712 \times \text{depth echo sounder (m.)}^{0.6268}$
mesh size in cod-end	35 mm
Type of survey	Stratified sampling
Station selection procedure	Random
Criterion to change position of a selected tow	<ul style="list-style-type: none"> - Unsuitable bottom for trawling according to ecosounder register. - Information on gear damage from previous surveys.
Criterion to reject data from tow	<ul style="list-style-type: none"> - tears in cod-end - severe tears in the gear - less than 20 minutes tow - bad behaviour of the gear
Daily period for fishing	6.00 to 22.00 hours
Species for sampling	All fish, squid, shrimp, and other invertebrates
Species for age determination	Cod, American plaice, redfish (<i>Sebastes mentella</i>), Greenland halibut and Roughhead grenadier (<i>Macrourus berglax</i>).

Table 2 – Cod (*Gadus morhua*) mean catch per towed mile and the estimated biomass by stratum, and their standard error in the 2011 survey.

stratum	square miles	hauls	catch (kg)		biomass (t)	
			mean	s.e.	value	s.e.
1	342	3	102.93	44.78	4,694	2,042
2	838	7	205.75	51.02	22,989	5,700
3	628	5	202.09	83.93	16,922	7,027
4	348	3	217.98	66.20	10,114	3,072
5	703	5	116.79	41.71	10,947	3,910
6	496	5	143.80	33.26	9,510	2,200
7	822	6	23.60	6.11	2,586	670
8	646	5	126.80	49.22	10,921	4,240
9	314	2	47.70	21.55	1,997	902
10	951	5	41.38	10.45	5,247	1,324
11	806	6	42.40	14.09	4,557	1,515
12	670	5	12.70	2.93	1,135	262
13	249	2	12.63	5.64	419	187
14	602	4	39.70	7.26	3,186	583
15	666	5	10.42	1.92	926	171
16	634	5				
17	216	1				
18	210	2				
19	414	3				
total	10 555	79	49.54	11.81	106,151	11,805

Table 3 – Cod (*Gadus morhua*) length distribution ('00000) in the 2011 survey.

length		length		length		length	
3-5	5	33-35	163	63-65	29	93-95	2
6-8		36-38	43	66-68	23	96-98	1
9-11	21	39-41	14	69-71	14	99-101	1
12-14	623	42-44	21	72-74	8	102-104	1
15-17	1818	45-47	46	75-77	6	105-107	1
18-20	933	48-50	58	78-80	5		
21-23	150	51-53	34	81-83	3		
24-26	266	54-56	22	84-86	4		
27-29	487	57-59	25	87-89	3		
30-32	402	60-62	29	90-92	2	total	5263

Table 4 – Cod (*Gadus morhua*) survey biomass (t) by strata in 1988-2011 surveys.

stratum	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	1345	649	767	5585	76	516	2165	1563	1006	243	125	99	250	86	477	173	1996	1091	2433	4420	4224	2253	11815	4694
2	10150	10323	2065	5486	5150	9044	8186	3040	3991	2049	1899	1502	740	491	736	102	1668	1888	4145	1775	5346	6627	23368	22989
3	4471	10276	2391	2459	8473	8435	6092	1146	1054	1132	703	145	360	230	451	90	9	1791	1948	11466	4129	7630	4512	16922
4	3130	4843	2446	2900	3443	14171	1885	746	1068	857	140	25	443	488	66	136	168	152	466	1132	771	5190	1716	10114
5	2130	10702	8447	10651	4570	6824	924	1274	936	1149	976	256	425	260	146	303	19	30	644	548	1129	6947	3600	10947
6	3230	6789	3286	1531	952	4220	1412	1310	620	1074	613	375	511	749	525	24	155	206	1224	3214	12487	10734	2303	9510
7	2224	16025	4385	2538	945	6153	857	122	55	1067	78	52	5	12	24	107	18		473	140	4692	12659	4667	2586
8	8931	16434	15973	5107	2349	7964	3615	349	93	1610	77	23	74	123	37	111	5		347	475	3471	2814	4204	10921
9	184	5261	6340	188	143	998	239	9	103	174		20	41		14	376			64	151	81	503	2048	1997
10	1338	4898	4193	1558	327	936	506	58	46	301	199	102	107	81	2	24		28	304	246	2625	5071	4275	5247
11	2505	13219	3859	1787	224	1678	582	78	41	310	176	255	106	175	18	58	33	56	381	272	3699	4336	4458	4557
12	335	2469	1587	126		24										71					42	339	588	1135
13	9	2534	734	93																	15	135	124	419
14	107	1121	545	131	67														76		160	9795	1056	3186
15	748	8436	2344	108												18				47	805	195	475	926
16		66																						
17		5																						
18	2																							
19																							88	
Total	40839	114050	59362	40248	26719	60963	26463	9695	9013	9966	4986	2854	3062	2695	2496	1593	4071	5242	12505	23886	43675	75228	69295	106151
s.e.	5784	12205	8225	6704	5837	17397	7367	2070	1459	1725	646	451	593	380	398	273	780	813	980	4526	5507	8109	16269	11805

s.e.: standard error

Table 5 – Cod (*Gadus morhua*) age-length key in 2011.

length cm	age														total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14+	
3- 5	13														13
6- 8	13														13
9-11	8														8
12-14	93														93
15-17	101														101
18-20	91														91
21-23	22	21													43
24-26		124													124
27-29		140													140
30-32		138													138
33-35		124													124
36-38		33	11												44
39-41		18	24												42
42-44		1	42												43
45-47			52	4											56
48-50			68	5											73
51-53			46	11	2										59
54-56			12	25	5										42
57-59			2	31	11										44
60-62				17	23										40
63-65				8	32	6									46
66-68				2	34	6									42
69-71				1	25	17	1								44
72-74					13	27	1								41
75-77					5	28	3								36
78-80					3	33	5								41
81-83					2	13	13								28
84-86						13	22								35
87-89						11	12								23
90-92						1	12		1						14
93-95							14		1						15
96-98							4		3						7
99- 1							3		6						9
102- 4							2		2		2				6
105- 7									4		5				9
108-10															
111-13											1				1
total	341	599	257	104	155	155	92		17		8				1728

Table 6 – Cod (*Gadus morhua*) abundance at age ('00000) by stratum in the 2011 survey.

age	stratum															total	mean	mean
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		weight	length
																	g	cm
1	12	708	524	847	278	616	145	71	9	171	95	1				3478	35	16
2	9	176	169	178	326	136	29	311	6	31	53	1		2	3	1431	200	29
3	18	61	46	10	9	12	1	8	1	2	1					169	884	47
4	5	20	19	3	2	6	1	3	1	1	2					63	1578	57
5	5	22	15	4	4	8	3	5	2	4	5	1		1		78	2286	64
6	2	7	3	2	3	1	1	2	1	3	2	1		3	1	31	3528	74
7		2	1	1	1				1	2	1	1		2		12	5840	87
8																		
9																2	8842	100
10																		
11																1	10586	106
12																		
13																		
14+																		
hauls	3	7	5	3	5	5	6	5	2	5	6	5	2	4	5	68		
total	50	995	777	1043	622	779	181	401	21	215	160	5	1	10	5	5265	1040	22.5

Table 7 – Cod (*Gadus morhua*) abundance at age (thousands) in 1988-2011 surveys.

age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	4 868	19 604	2 303	129 032	71 533	4 075	3 017	1 425	36	37	23	5
2	79 905	10 800	12 348	26 220	41 923	138 357	4 130	11 901	3 121	150	83	84
3	49 496	91 303	5 121	16 903	5 578	31 096	27 756	1 338	6 659	3 478	95	116
4	13 448	54 613	16 952	2 125	2 385	1 099	5 097	3 892	892	4 803	1 256	117
5	1 457	20 424	15 834	6 757	385	1 317	130	928	2 407	391	1 572	717
6	211	1 336	4 492	1 731	1 398	173	67	33	192	952	78	444
7	225	143	340	299	244	489	7	23	8	21	146	19
8	72	126	146	68	14	87	111	0	5	0	0	5
9		6	77	32	0		0	21		0	6	
10		7	25	4	0		5	5		0		
11				10	8					0		
12										4		
13												
14												
total	149 683	198 363	57 637	183 181	123 468	176 693	40 319	19 567	13 320	9 837	3 259	1 507

age	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	178	473	0	684	13	8 066	19 711	3 912	6 090	5 133	66 500	347 781
2	16	1 990	1 330	54	3 380	16	3 876	11 625	16 670	7 479	27 760	143 061
3	327	13	641	628	25	1 118	56	5 021	12 440	16 167	8 640	16 918
4	198	122	29	134	602	80	1 472	21	4 530	14 299	7 660	6 325
5	96	79	70	22	168	708	88	1 138	70	4 151	5 000	7 787
6	446	15	33	42	19	137	587	58	940	23	1 800	3 150
7	172	142	26	7	5	0	121	425	60	1 088	10	1 159
8	11	99	96	8	10	16	8	74	230		460	0
9	17	6	30	39	3	8	0	13	80	335	50	192
10	0	6	0	24	5	8	8	20			260	0
11	0	6	5		16		8		10		30	88
12	5						0			14		
13	0						8					
14	5											
total	1 470	2 951	2 261	1 642	4 229	10 157	25 959	22 307	41 120	48 696	118 180	526 461

Table 8 – American plaice (*Hippoglossoides platessoides*) mean catch per towed mile and the estimated biomass by stratum, and their standard error in the 2011 survey.

stratum	square miles	hauls	catch (kg)		biomass (t)	
			mean	s.e.	value	s.e.
1	342	3	15.20	13.13	693	599
2	838	7	10.21	1.78	1 141	199
3	628	5	4.34	2.24	364	187
4	348	3	25.87	8.18	1 201	380
5	703	5	2.03	1.54	190	145
6	496	5	2.41	0.47	160	31
7	822	6	1.46	0.76	160	83
8	646	5	0.76	0.49	65	43
9	314	2				
10	951	5	0.28	0.18	35	22
11	806	6	0.31	0.09	33	9
12	670	5				
13	249	2				
14	602	4	0.40	0.17	32	14
15	666	5	0.11	0.11	10	10
16	634	5				
17	216	1				
18	210	1				
19	414	3				
total	10 555	78	1.91	0.78	4 084	780

Table 9 – American plaice (*Hippoglossoides platessoides*) abundance at age (thousands) in 1988-2011 surveys.

age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	0	40	8	40	0	0	0	0	8	8	0	8	16	0	0	8	0	0	7	207	51	26	10	371
2	402	563	426	354	852	8	40	32	32	16	24	0	24	40	0	8	113	32	28	7	1492	293	341	562
3	1882	8364	917	1206	796	1544	48	113	121	113	32	24	8	48	32	32	281	113	37	13	69	1107	608	1296
4	1311	1874	8372	2171	1070	1086	2131	740	257	24	48	64	80	56	64	97	72	290	106	35		147	2000	2290
5	4230	4367	1126	5348	1938	780	1037	2131	587	121	72	80	105	105	16	80	80	105	133	106	32	29	301	422
6	6385	4359	3370	2445	4769	418	877	1367	1665	418	265	80	153	56	88	56	105	105	139	119	127	22	187	89
7	5010	4142	2340	2686	1279	4134	973	1375	893	1206	619	241	121	113	64	48	105	129	72	49	120	80	72	47
8	5460	2429	2228	2067	1504	450	3426	909	547	273	901	474	153	265	129	137	129	105	57	49	108	57	139	85
9	1753	804	1351	852	828	780	322	1536	402	410	523	507	394	434	161	290	249	225	123	35	104	94	122	172
10	458	346	627	298	378	370	651	161	627	290	354	257	426	579	193	233	314	201	163	47	111	90	70	143
11	97	40	113	8	177	257	225	177	145	491	298	338	225	483	298	426	281	225	200	76	63	132	56	55
12	161	16	16	56	97	306	225	145	80	129	290	209	185	418	225	483	595	249	193	122	47	121	176	105
13	129	0	32	0	16	362	249	145	80	24	88	121	72	193	249	281	426	354	192	143	118	63	125	145
14	48	0	16	0	0	1070	523	290	105	97	113	121	56	161	145	265	402	394	213	82	110	104	114	82
15	56	0	0	0	0	32	491	217	72	48	56	56	48	113	129	145	330	257	201	75	150	121	134	661
16+	40	0	0	0	0	40	8	32	24	113	105	97	56	97	185	161	523	547	323	236	561	353	497	371
total	27415	27351	20949	17523	13711	11637	11226	9377	5645	3772	3804	2670	2131	3169	1970	2766	4013	3329	2188	1401	3262	2838	4952	2006
N6+	19598	12135	10093	8412	9047	8219	7970	6353	4640	3498	3611	2501	1890	2911	1866	2525	3458	2791	1877	1033	1619	1237	1692	6524

Table 10 – American plaice (*Hippoglossoides platessoides*) survey biomass (t) by strata in 1988-2011.

stratum	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	1306	1000	505	1078	709	1079	661	2230	1462	381	156	372	345	1043	141	1292	1507	1038	714	284	144	548	716	693
2	2845	3602	1375	2663	1714	1267	1199	1335	943	740	1587	1810	976	835	1262	713	768	796	354	209	513	370	1084	1141
3	1367	1118	1668	1247	631	444	325	252	168	495	284	97	21	93	75	17	427	101	74	101	147	74	103	364
4	2199	461	817	320	557	572	853	489	268	203	343	53	100	85	128		395	359	109	153	440	36	91	1201
5	2599	3093	1830	1407	837	1291	1230	549	500	619	744	73	56	112	189	82	72	45	63	81	88	72	200	190
6	479	1130	954	501	601	305	808	123	32	13	35	40	25	37	63	29	26	71	61	99	37	57	34	160
7	1174	531	837	389	639	319	316	249	72	83	47	19	15	28	52	30	84	31	37	20	47	32	28	160
8	417	164	263	251	727	487	171	132	56	123	165	3		45	43	14	55	175	163	58	128	47	49	65
9	103	163	343		373	205	20	500	55	36					1	9	77	18				77		
10	2323	1491	2000	1308	1406	1459	2236	708	415	287	36	72	45	95	36	54	45	87	97	24	163	54	115	35
11	1186	1168	1316	401	372	292	303	109	68	32	29	37	23	27	59	29	69	35	19	22	50	64	26	33
12	9	19	45	17	11	15	33	12	32	7				4		11						11		
13	3		20					3																
14	8	8	7	389	29		24	15	4		4	9												32
15	23	99	3	97	37	109	40	68	23	7	7					6		4		3	7	1		10
16	5			4	9	12	5																	
17																								
18																								
19				15	4	5	3	11																
Total	6046	4047	1983	0087	8656	7861	8227	6785	4098	3026	3437	2585	1606	2404	2049	2286	3525	2760	1691	1053	1766	1442	2446	4084
e.t	1845	2048	1276	1180	954	1040	1373	1083	912	708	751	869	332	429	729	748	740	684	342	159	150	164	526	780

Table 11 – American plaice (*Hippoglossoides platessoides*) length distribution ('00) in the 2011 survey.

length	nd	indet.	male	male	length	male	female	length	male	female
16-17			253		30-31	4162	3535	44-45	1039	660
18-19			1214	361	32-33	4612	2226	46-47	175	646
20-21	94		870	539	34-35	3643	1709	48-49	256	935
22-23			368	444	36-37	2950	2379	50-51		1251
24-25			590	504	38-39	1617	3970	52-53	88	2535
26-27			1316	870	40-41	1855	4412	54-55		1386
28-29			2997	2161	42-43	2637	2547	56-57		1427

Table 12 – American plaice (*Hippoglossoides platessoides*) abundance at age in the 2011 survey, strata 1-19. Abundance in thousands.

age	stratum												total	mean weight (g)	mean length (cm)
	1	2	3	4	5	6	7	8	10	11	14	15			
2		63	84	21		117	78			9			371	67	20
3	27	141	89	92	1	172	14		2	25			562	183	27
4	244	352	207	212	12	167	33	1	23	44		1	1296	286	31
5	438	681	276	507	50	121	119	18	35	29	14	3	2290	497	36
6	66	133	40	113	9	17	26	4	4	2	7	1	422	609	39
7	27	28	3	26	2	1		2					89	681	40
8	11	18	3	13	1			1					47	811	42
9	21	27	9	21	4	1		2					85	936	44
10	48	33	14	64	3	2	6	1			2		172	1078	46
11	71	25	2	40	2	1							143	1000	45
12	26	16		9			2				2		55	919	44
13	42	23	2	29	1	1	4				4		105	1009	45
14	43	33	10	50	5	1	2	1					145	1201	47
15	22	21	6	28	2	1	2						82	1118	47
16	38	22	2	25	2	1							90	1124	46
17	36	23	2	36	4	3	1						105	1353	49
18	9	30	7	44	8		1	1					101	1605	52
19	2	8	2	17	2								32	1692	53
20	9	34	6	47	3	3	3						105	1794	54
21	26	32	4	24	3	3	1						94	1388	50
22	2	11	2	14	1		1						31	1770	54
23	12	9	2	13		1	1						38	1330	48
24+	18	18	2	23	2		1						65	1540	51
hauls	3	7	5	3	3	5	5	2	3	5	3	1	45		
total	1237	1781	776	1469	118	611	295	32	63	109	29	4	6524	3803	36.3

Table 13 – American plaice (*Hippoglossoides platessoides*) age-length key in 2011.**MALE**

Length	age																								total
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24+		
14-15																								0	
16-17	3																							3	
18-19	11																							11	
20-21	5	2																						7	
22-23	3	1																						4	
24-25	1	2	1																					4	
26-27		10	1																					11	
28-29		6	18	6																				30	
30-31		3	19	6																				28	
32-33			8	20																				28	
34-35			4	16	3																			23	
36-37			1	14	5																			20	
38-39				1	2	3	2	2		1							1							12	
40-41						1		1	3	1		1	1	1	1							1		11	
42-43									1	3	1	2	2		1	2							1	13	
44-45											1			1	1					2				5	
46-47										1														1	
48-49																1			1	1				3	
total:	23	24	52	63	10	4	2	3	4	6	2	3	3	2	3	3	1		1	3		1	1	214	

FEMALE

Length cm	age																								total
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
16-17																								0	
18-19	3																							3	
20-21	4																							4	
22-23	3	1																						4	
24-25		2																						2	
26-27		7																						7	
28-29		8	11																					19	
30-31		3	24	5																				32	
32-33			10	11																				21	
34-35			5	11																				16	
36-37			4	20	1																			25	
38-39				25	9																			34	
40-41				31	8	1																		40	
42-43				17	6	1	1	1																26	
44-45				5		1																		6	
46-47					1				1		1	2												5	
48-49									2				1	1										4	
50-51								1	3	2			2	1			2			1				12	
52-53									2	2		2	3	1	2	2	1	2	4		2	1	1	25	
54-55										1			1		1	2	3	1	1	1			1	12	
56-57																1	2		4	2	1	1	2	13	
total:	10	21	54	125	25	3	2	4	7	3	1	4	7	3	3	5	8	3	9	4	3	2	4	310	

Table 14 – Redfish biomass (t) estimated by strata in the 2011 survey.

stratum	square miles	hauls	<i>S. marinus</i>	<i>S. mentella</i>	<i>S. fasciatus</i>	juvenile	Total
1	342	3	40	1	3	7	51
2	838	7	87	1	6	31	125
3	628	5	1 831	4	207	117	2 159
4	348	3	237		6	8	251
5	703	5	834	12	142	100	1 088
6	496	5	477	1	115	134	727
7	822	6	6 435	3 472	10 938	1 509	22 354
8	646	5	5 502	2 159	6 393	292	14 346
9	314	2	5 429	1 473	3 265	1 242	11 409
10	951	5	2 689	614	2 285	582	6 170
11	806	6	4 244	871	2 821	469	8 405
12	670	5		52 020	8 434		60 454
13	249	2	199	11 569	2 885		14 653
14	602	4	510	9 327	5 151	52	15 040
15	666	5	543	21 182	17 004		38 729
16	634	5		163	75		238
17	216	1					0
18	210	2		746	14		760
19	414	3		63	9		72
20	525	5		20			20
21	517	6		6			6
22	533	5		6			6
23	284	2					
24	253	2			3		3
25	226	2					
28	530	4		4	4		8
29	488	4		5			5
30	1 134	10					
31	203	2					
32	238	2					
33	98	2			3		3
34	486	3					
1-19	10 555	79	29 056	103 678	59 753	4 543	197 031
total	16 070	128	29 056	103 718	59 763	4 543	197 080

Table 15 – Redfish biomass (t) estimated by strata in the survey series.

	year	<i>Sebastes marinus</i>	<i>Sebastes spp</i>			total
			<i>mentella</i>	<i>fasciatus</i>	juvenile	
150-730 m	1988	18 229	170 102			188 331
	1989	27 312	135 223			162 535
	1990	16 751	86 695		23 311	126 757
	1991	4 864	59 552	6 755	5 784	76 955
	1992	4 909	85 408	6 314	33 578	130 209
	1993	4 789	21 235	5 175	41 409	72 608
	1994	39 516	42 495	9 303	71 211	162 525
	1995	10 754	70 567	5 986	337	87 644
	1996	13 431	92 647	13 112	472	119 662
	1997	77 125	66 710	20 780	1 201	165 816
	1998	7 640	53 946	7 656	1 590	70 832
	1999	11 215	77 610	9 460	366	98 651
	2000	53 388	106 283	15 364	2 955	177 990
	2001	10 244	45 931	13 715	7 455	77 345
	2002	11 651	48 760	27 556	33 345	121 312
	2003	40 110	28 785	15 031	9 890	93 816
	2004	85 383	45 999	76 164	43 059	250 605
	2005	147 688	105 110	123 326	75 762	451 215
	2006	298 290	105 849	319 387	43 396	766 922
	2007	88 071	51 183	261 788	63 576	464 618
	2008	240 777	42 570	202 287	80 491	566 647
	2009	72 211	111 787	171 676	2 804	358 479
	2010	47 377	62 684	97 067	5 083	212 211
	2011	29 056	103 678	59 753	4 543	197 031
150-1460 m	2004	85 383	46 030	76 166	43 059	250 638
	2005	147 688	105 153	123 336	75 762	451 268
	2006	298 290	105 877	319 389	43 396	766 952
	2007	88 071	51 207	261 806	63 576	464 660
	2008	240 777	42 621	202 307	80 492	566 718
	2009	72 211	111 801	171 705	2 804	358 521
	2010	47 377	62 746	97 074	5 085	212 282
	2011	29 056	103 718	59 763	4 543	197 080

Table 16 – Redfish (*Sebastes marinus*) length distribution ('000) in the 2011 survey.

length	indet.	male	female	length	male	female	length	male	female
9		9		22	3224	2870	35	946	1017
10				23	3347	2366	36	813	937
11				24	2999	3313	37	665	709
12				25	2926	3088	38	23	1007
13				26	1946	1782	39	13	1030
14	164	57	93	27	1551	2020	40	10	514
15		552	539	28	2346	1862	41	55	137
16	328	397	669	29	2207	1329	42	35	13
17		793	934	30	1614	1958	43	23	62
18		964	1043	31	2589	1103	44	11	53
19		1193	1254	32	2857	816	45		10
20		2889	1879	33	3136	1035	46		20
21		3716	2680	34	1964	987	47		35

Table 17 – Redfish (*Sebastes mentella*) length distribution ('0000) in the 2011 survey.

length	indet.	male	female	length	male	female	length	male	female
7		9		18	1116	910	29	64	127
8				19	2217	1989	30	40	25
9				20	4882	3971	31	81	35
10	3			21	6852	5774	32	1	8
11	5			22	6401	5106	33	1	12
12	3	3		23	4644	4326	34		3
13		3		24	3332	3495	35		
14		43	15	25	1747	1366	36		1
15		504	407	26	496	658	37		1
16		975	831	27	337	404	38		
17		765	652	28	205	231	39		

Table 18– Redfish (*Sebastes fasciatus*) length distribution ('0000) in the 2011 survey.

length	indet.	male	female	length	indet.	male	female	length	male	female
13		6	47	22		2802	904	31	1	123
14	9	250	205	23	2	2562	1176	32		170
15	30	608	605	24		1563	1248	33		84
16	18	791	1066	25		675	1769	34		34
17	2	853	864	26	1	330	1453	35		
18		595	749	27		147	1031	36		
19		648	445	28		52	735	37		
20		1097	439	29		32	384	38		1
21	1	1950	561	30		14	284	39		

Table 19 – Juvenile redbfish (*Sebastes sp.*) length distribution ('00000) in the 2011 survey.

length	Indet.
7	3
8	102
9	623
10	645
11	948
12	2020
13	3474
14	3565
15	1649
16	274
17	32

Table 20 – *Sebastes mentella*: age-length key in the 2011 survey.**MALE**

length	age																		total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18+	
14	2	3																	5
15		7																	7
16		2	6																8
17		1	7																8
18			8	3															11
19			1	11	1														13
20				7	6	3													16
21				5	8	2													15
22				4	9	4	1												18
23					5	8	3												16
24				1		4	4												9
25						6	4												10
26								4	1	2									7
27								2	1		1		1						5
28								3	1	3	1	1							9
29								1			1		1		2				5
30											1					1			2
31										1			1						2
...																			
36																1			1
total	2	13	22	31	29	27	12	10	3	6	4	1	3		2	2			167

FEMALE

length	age																									total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
14	1	1																								2
15	1	6																								7
16		6	2																							8
17		1	9	1																						11
18			4	7																						11
19				13	1																					14
20				9	8	2																				19
21				5	8	5																				18
22				6	6	4	2																			18
23					2	8	3																			13
24				1		7	3																			11
25					3	5																				8
26						4	1	1	1																	7
27							2	1	1																	4
28							1	3	1		1	1														7
29								2	2																	4
30										2		2														4
31										1	3															4
32											1				1											2
33									1		2					1										3
34									1		1					1										3
35																										
36																								1		1
37																				1	1					2
...																										
41																									1	1
total	2	14	15	42	25	29	17	4	7	7	3	8	3	2						1	1		1	1		182

Table 21 – *Sebastes mentella*: frequency at age ('00000) by strata in the 2011 survey.

age	strata																							estim.	TOTAL	mean	mean
	1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	18	19	20	22	28	29	total	weight			length	
1						6	1		1	1													8		8	44	15
2						104	23	22	21	16	4												192		192	53	16
3						149	37	25	26	28	57	10	7	7									347		347	70	17
4						100	46	33	12	23	917	197	102	201		7							1638	1	1639	119	20
5						39	33	28	8	15	964	238	124	246		11							1706	1	1706	134	21
6						18	28	18	5	8	971	197	140	265	1	16							1666	1	1666	163	23
7						2	9	5	1	2	407	85	80	117	1	8							715		716	186	24
8						1	1				31	12	30	7		1							83		83	261	27
9											14	9	21	6		1							52		52	275	27
10											20	9	18	5		1							55		55	282	27
11											5	3	5	1									14		14	310	28
12											1	3	4	1									9		9	353	29
13											6	3	6	1									17		17	321	29
14																										481	33
15												2	1										3		3	355	30
16											2												2		2	369	30
17																										477	33
18																										485	33
19																										475	33
20																										684	37
21																										678	37
22																										487	33
23																										469	33
24																										633	36
25+																										476	33
total						419	178	130	74	93	3399	769	537	858	3	45	1						6508	3	6510	929	21.5

Table 22 – Greenland halibut (*Reinhardtius hippoglossoides*) mean catch per towed mile and the estimated biomass by stratum, and their standard error in the 2011 survey.

stratum	square miles	hauls	catch (kg)		biomass (t)	
			mean	s.e.	value	s.e.
1	342	3				
2	838	7				
3	628	5				
4	348	3				
5	703	5	0.06	0.06	6	6
6	496	5				
7	822	6	0.03	0.03	4	4
8	646	5				
9	314	2				
10	951	5	0.04	0.04	5	5
11	806	6	0.01	0.01	2	2
12	670	5	1.41	0.67	126	60
13	249	2	1.00	1.00	33	33
14	602	4	0.43	0.22	35	18
15	666	5	1.26	0.74	112	66
16	634	5	22.38	3.32	1892	281
17 ¹	216	1			288	
18	210	2	20.09	5.42	562	152
19	414	3	67.02	49.04	3700	2707
20	525	5	35.30	6.66	2471	466
21	517	6	18.24	7.17	1258	494
22	533	5	17.25	5.26	1226	374
23	284	2	12.26	2.73	464	103
24	253	2	51.84	44.91	1749	1515
25	226	2	19.68	2.80	593	84
28	530	4	59.27	5.95	4188	420
29	488	4	31.41	5.11	2044	332
30	1134	10	33.47	9.57	5060	1447
31	203	2	15.31	1.22	414	33
32	238	2	60.37	10.78	1916	342
33	98	2	54.13	8.06	707	105
34	486	3	53.31	21.66	3454	1404
total	17051	128	14.94	3.86	32020	3862
strata 1-19	10555	78	4.60	2.94	6765	2728

¹) – estimated

Table 23 – Greenland halibut (*Reinhardtius hippoglossoides*) survey biomass (t) by strata in 1988-2011.

stratum	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1												
2		3	6					121		2	6	3
3	26	31	8	8	18	3		21	108	90	367	347
4	144	20		15	27	10		5	0	23	41	197
5	74	98		28	42	1	2	21	36	98	173	409
6	31	18	15	12	8	15		31	106	228	361	301
7	85	63	58	189	246	94	214	904	1 148	1 423	2 607	2 356
8	151	222	62	180	379	140	46	333	359	1 065	989	1 993
9	180	165	53	76	323	30	43	178	160	254	471	354
10	108	82	58	172	362	31	235	526	716	862	1 369	1 528
11	45	61	22	106	229	234	236	492	671	627	1 227	1 320
12	405	647	288	761	619	933	1 219	1 147	2 124	2 248	3 077	3 661
13	64	124	218	44	24	143	152	127	298	484	554	978
14	368	302	284	787	847		620	410	902	1 589	1 461	1 080
15	435	169	525	973	643	1 378	1 492	1 768	1 448	2 689	4 055	2 987
16	1 374	1 363	2 543	2 527	1 827	2 175	1 524	1 861	2 098	1 770	3 356	1 143
17	266	120	127	415	40		742	742	258	525	737	603
18	106	50	506	354	58		386	958	191	557	775	932
19	3 064	934	1 026	1 522	3 036	1 342	1 126	1 230	971	1 564	2 603	1 015
20												
21												
22												
23												
24												
25												
28												
29												
30												
31												
32												
33												
34												
total (1-19)	6 926	4 472	5 799	8 169	8 728	6 529	8 037	10 875	11 594	16 098	24 229	21 207
s.e. (1-19)	768	392	809	817	1 389	956	678	1 226	882	1 136	1 348	1 520

Table 23 (continuation)

stratum	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1					2							
2		15	10		12	7	9					
3	244	384	140	55	852	416	325	22		4	6	
4	207	157	58	105	347	91	182	8				
5	307	268	66	92	254	280	231	92	15	7		6
6	178	265	104	21	466	332	61	75	8			
7	1 570	982	429	414	1 032	596	778	729	524	11	15	4
8	1 317	1 124	878	507	811	934	910	432	226	31		
9	245	355	138	140	464	91	550	487	401	31		
10	1 602	1 743	744	286	753	1 058	850	560	777	25	19	5
11	1 088	1 021	338	277	631	1 063	290	503	563	21	32	2
12	2 174	1 582	1 086	673	902	1 020	978	1 246	1 393	1 217	743	126
13	382	291	521	61	447	310	219	392	431	217	273	33
14	491	877	1 081	885	1 658	618	573	878	1 023	742	62	35
15	2 687	1 616	1 233	607	1 084	1 747	1 783	3 041	1 621	771	1 224	112
16	2 016	1 328	2 182	633	1 166	1 357	1 752	2 263	1 623	2 186	2 079	1 892
17	498	170	204	148	223	429	639	407	411	558	446	288
18	179	574	694	1 062	578	434	606	865	944	540	526	562
19	1 774	1 120	2 194	248	608	915	971	1 042	2 035	1 414	1 231	3 700
20					1 647	1 061	666	2 041	4 119	1 855	1 490	2 471
21					906	345	359	742	2 161	1 569	1 367	1 258
22					607	510	845	551	883	1 970	2 410	1 226
23					407	42	130	495	1 144	475	715	464
24					208	328	555	588	1 082	1 185	461	1 749
25					2 377	993	322	436	441	732	473	593
28					1 728	1 162	1 239	2 857	3 920	3 153	1 994	4 188
29					2 300	1 330	674	1 488	3 335	2 618	2 091	2 044
30					2 024	602	2 772	4 719	5 066	7 692	5 381	5 060
31					546	186	354	347	385	944	319	414
32					599	596	1 357	1 040	1 755	2 391	1 539	1 916
33					358	147	608	166	698	309	408	707
34					2 675	1 460	1 886	2 222	2 627	3 377	1 790	3 454
total (1-19)	16 959	13 872	12 100	6 214	12 292	11 698	11 708	13 040	11 997	7 777	6 657	6 765
s.e. (1-19)	923	776	662	611	400	630	609	786	583	363	814	2 728
Total					28 676	20 460	23 475	30 731	39 614	36 047	27 096	32 309
s.e. Total					2 666	933	1 240	2 512	2 623	3 075	1 791	3 862

Table 24 – Greenland halibut (*Reinhardtius hippoglossoides*) length distribution in the 2011 survey.**In the 19 shallowest strata (hundreds):**

length	ind.	male	female	length	ind.	male	female	length	ind.	male	female
26-27	17			44-45		5074	4774	62-63			306
28-29		122	102	46-47		4160	7128	64-65		49	
30-31				48-49		4578	7021	66-67			
32-33		317		50-51		3349	5785	68-69			
34-35		124	318	52-53		1403	4940	70-71			
36-37		384	344	54-55		539	3144	72-73			
38-39		1459	1181	56-57		369	2513	74-75			82
40-41		2689	1856	58-59		112	1009	76-77			
42-43		3291	4279	60-61			371	78-79			

In the whole bank (thousands):

length	ind.	male	female	length	ind.	male	female	length	ind.	male	female
22-23		15		48-49		1689	1925	74-75		9	107
24-25				50-51		1280	2131	76-77			37
26-27	2			52-53		903	1697	78-79			35
28-29		12	10	54-55		757	1689	80-81			29
30-31				56-57		311	1413	82-83			10
32-33		41	9	58-59		178	971	84-85			
34-35		88	64	60-61		85	905	86-87			10
36-37		97	117	62-63		44	614	88-89			11
38-39		338	277	64-65		32	340	90-91			10
40-41		707	536	66-67			182	92-93		7	
42-43		889	1039	68-69			249	94-95			9
44-45		1215	1504	70-71			94	96-97			
46-47		1310	1871	72-73			56	98-99			

Table 25 - Greenland halibut (*Reinhardtius hippoglossoides*) age-length key in the 2011 survey.

MALE														
length	age													
cm	3	4	5	6	7	8	9	10	11	12	13	14	15	16+
22-23	1													
24-25	1													
26-27														
28-29		1												
30-31														
32-33		1	2											
34-35		1	6											
36-37		1	12											
38-39			29	5										
40-41			22	18	1									
42-43			10	30	1									
44-45			2	40	5									
46-47			1	25	15									
48-49				24	25									
50-51				5	38	3								
52-53				1	32	9								
54-55					24	18								
56-57					14	21	5							
58-59					3	7	8	1						
60-61						1	3	4						
62-63								2	2					
64-65								2	1	1				
total:	2	4	84	148	158	59	16	9	3	1				484

FEMALE														
length	age													
cm	3	4	5	6	7	8	9	10	11	12	13	14	15	16+
28-29		1												
30-31														
32-33		1												
34-35			2											
36-37		2	11	1										
38-39		1	16	1										
40-41			19	16										
42-43			6	35	1									
44-45			5	31	5									
46-47				26	18									
48-49				12	29									
50-51				5	32	5								
52-53					36	10	1							
54-55					19	17	5							
56-57					11	17	9	4						
58-59					2	16	15	8						
60-61							11	26	3	1				
62-63							4	22	12	2				
64-65								14	16	5	1			
66-67								4	10	11	7			
68-69									7	9	10			
70-71										8	8	3		
72-73										3	3	3	1	
74-75										1	6	5	1	
76-77											2	2	1	
78-79												3		
80-81												2	3	1
82-83														3
84-85													1	1
86-87														2
88-89													1	1
90-91														2
92-93														1
94-95														1
total:	5	59	127	153	65	45	78	48	40	37	18	8	11	694

Table 26 – Greenland halibut (*Reinhardtius hippoglossoides*) abundance at age ('0000) by strata in the 2011 survey.

age	strata																												total	estima- tion	TOTAL	mean weight (g)	mean length (cm)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	5	7	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	28	29	30	31	32	33	34																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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Table 27 – Greenland halibut (*Reinhardtius hippoglossoides*) abundance at age (thousands) in the upper 19 strata (up) and in the whole 32 strata (down).

age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	1302	1677	1423	1429	9978	4699	2674	2200	852	3014	6459	3282	1768	1762	437	548	336	157	61	38	
2	207	1260	1245	996	2045	6408	3036	1716	563	235	1153	2364	804	2644	652	322	74	78	7	9	
3	348	447	777	1365	1793	1942	4822	6180	2419	479	1456	2248	489	3517	2554	525	456	121	30	29	
4	1054	1023	692	1435	1535	2442	5225	8843	8419	1741	799	1342	1217	1585	2007	943	275	155	79	47	51
5	2307	1852	1021	1545	2136	3380	5714	9919	10787	5703	2242	3045	1991	5601	5537	4807	2765	1205	620	894	832
6	1291	2249	1545	2385	4099	4680	6800	9085	10119	11336	6262	4498	2362	6271	6105	6002	5928	4584	2888	2469	2837
7	2212	1947	1627	2139	3029	2001	4014	6304	4467	4346	5328	4610	1552	2040	2345	2665	4632	4950	3258	2365	2777
8	534	1054	1266	1180	1706	1299	1731	2108	1466	1865	2584	1025	375	518	491	623	1217	909	715	715	546
9	462	468	776	631	1052	341	528	600	280	361	147	104	105	233	89	180	247	283	153	259	163
10	352	273	213	219	209	70	177	157	82	92	36	48	79	107	97	143	165	210	215	137	88
11	141	138	104	90	53	21	23	27	6	44	5	16	15	63	44	103	62	100	62	50	13
12	12	67	38	47	18	31	17	6	3			6	4	38	15	45	38	43	47	22	4
13		25	21	18			17	16	3					5	3	10	5	18	35	10	4
14		12	9		5	4			5					3	3		2	10	12	2	3
15	15					5	6							3	3			4			1
16+	8						9							3	3			1			
total	10245	12490	10757	13479	27659	27323	34792	47160	39470	29216	26471	22587	10762	24390	20374	16918	16204	12825	8182	7047	7319

age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1														1710	424	560	350	160	60	38	
2														2680	621	320	70	80	10	9	
3														3580	2374	540	480	120	40	29	10
4														1880	1810	1110	360	200	100	137	100
5														8330	5085	7160	4700	2480	1410	2447	2220
6														11210	6420	10480	11130	11020	8290	7356	8150
7														6060	3180	5730	10490	15340	14010	9587	10380
8														1790	874	1700	3530	3890	4340	3063	3140
9														890	171	510	880	1400	1130	1200	1370
10														450	293	440	720	1060	1260	1019	1500
11														320	152	370	370	540	440	383	560
12														200	91	180	210	300	340	213	320
13														180	50	60	80	160	310	151	270
14														70	23	30	60	120	170	114	130
15														80	9	10	20	80	50	59	50
16+														60		10	10	70	70	55	4
total														39470	21578	29210	33440	37030	32020	25860	28260

Table 28 – Roughhead grenadier (*Macrourus berglax*) mean catch per towed mile and the estimated biomass by stratum, and their standard error in the 2011 survey

stratum	square miles	hauls	catch (kg)		biomass (t)	
			mean	s.e.	mean	s.e.
1	342	3				
2	838	7				
3	628	5				
4	348	3				
5	703	5				
6	496	5				
7	822	6				
8	646	5				
9	314	2				
10	951	5				
11	806	6				
12	670	5	0.00	0.00	0	0
13	249	2	1.30	1.30	43	43
14	602	4	0.12	0.10	10	8
15	666	5	0.09	0.06	8	5
16	634	5	1.33	0.78	112	66
17 ¹	216	1			80	
18	210	2	15.90	14.25	445	399
19	414	3	1.31	0.76	73	42
20	525	5	1.11	0.29	78	20
21	517	6	23.30	9.90	1606	682
22	533	5	22.66	9.62	1610	683
23	284	2	13.35	6.77	506	256
24	253	2	6.58	1.26	222	43
25	226	2	3.26	1.03	98	31
28	530	4	1.95	0.43	137	31
29	488	4	2.50	0.90	163	59
30	1134	10	19.61	3.29	2965	498
31	203	2	10.89	6.81	295	184
32	238	2	5.42	2.87	172	91
33	98	2	8.59	2.68	112	35
34	486	3	2.24	0.19	145	12
<hr/>						
Total	16 070	128	4.11	1.21	8881	1212
total 1-19	10 555	78			771	409

¹) – estimated

Table 29 – Roughhead grenadier (*Macrourus berglax*) survey biomass (t) by strata in 1988-2011.

stratum	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1												
2								8				
3												
4												
5												
6									22			
7					0							
8		10		1					11	3		7
9	47	4		5	28	21	3	21	153	18	40	45
10	1								6	1		18
11												3
12	112	103	40	108	100	413	55	126	46	137	55	191
13	21	64	18	18	60	18	32	75	5	18	78	92
14	200	145	107	85	139		73	67	270	77	194	135
15	92	5	29	64	52	321	82	180	84	69	101	72
16	349	140	212	229	432	1 333	523	256	397	211	405	150
17	134	45	31	180	123		98	129	27	116	204	96
18	311	128	143	356	215		756	414	154	224	189	313
19	743	227	273	289	429	915	352	282	187	322	424	129
20												
21												
22												
23												
24												
25												
28												
29												
30												
31												
32												
33												
34												
total (1-19)	2 009	871	852	1 335	1 577	3 021	1 975	1 558	1 362	1 197	1 691	1 250
s.e. (1-19)	264	142	149	250	270	487	169	223	277	169	243	338

Table 29 (continuation)

stratum	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1												
2												
3					10							
4				9								
5												
6												
7	3	0		0	10							
8		16	2	13	28	65	13					
9	29	29		30	282	82	181	17	39			
10	68	18		0	48	38	21					
11	8	6			3	2						
12	81	236	154	165	292	207	97	22	92	73	60	0
13	50	116	121	123	299	94	154	80	108	25	97	43
14	103	292	124	346	877	379	362	223	539	1	3	10
15	103	60	16	87	259	16	85	55	12		132	8
16	225	338	272	352	594	426	1 391	242	493	213	79	112
17	67	370	380	101	244	124	603	70	385	40	278	80
18	219	383	27	877	423	588	435	491	610	194	685	445
19	92	216	116	245	228	366	592	167	683	235	69	73
20					419	182	353	144	269	130	355	78
21					1 432	996	763	755	1 114	528	1 135	1 606
22					1 095	1 115	1 545	608	1 735	1 216	967	1 610
23					897	463	342	332	399	305	388	506
24					137	1 030	419	165	152	146	207	222
25					344	870	817	197	391	362	149	98
28					425	695	610	299	360	273	338	137
29					3 113	1 012	445	527	555	424	509	163
30					3 553	2 869	1 108	2 139	3 356	2 560	2 816	2 965
31					650	327	235	242	176	225	107	295
32					274	267	132	86	222	197	242	172
33					118	17	122	105	38	12	57	112
34					1 131	330	511	305	410	144	419	145
total (1-19)	1 047	2 079	1 211	2 348	3 597	2 387	3 933	1 367	2 961	782	1 403	771
s.e.(1-19)	196	284	176	611	362	282	697	310	305	103	197	409
Total					17 184	14 253	12 109	7 807	12 139	7 304	9 091	8 881
s.e. Total					1 616	1 563	1 225	836	659	478	930	1 212

Table 30 - Roughhead grenadier (*Macrourus berglax*) length distribution ('00) in the 2011 survey.

length	Ind.	male	female	length	Ind.	male	female	length	Ind.	male	female
3	601			16		4838	2305	29			2316
4			94	17		5160	2352	30			1940
5	111	143	288	18		3724	2256	31			1967
6	54	360	780	19		3432	1806	32			953
7	75	774	397	20		2303	1592	33			835
8	88	1861	712	21		2155	1869	34			798
9		1216	618	22		713	2211	35			377
10		1611	700	23		682	1975	36			149
11		2562	1076	24	72	371	1927	37			303
12	211	2531	1589	25			2626	38			124
13		3382	1300	26			2901	39			124
14		3684	2021	27			3040	40			124
15		5433	2630	28			2772	41			191

Table 31 - Roughhead grenadier (*Macrourus berglax*) age-length key in the 2011 survey.**MALE**

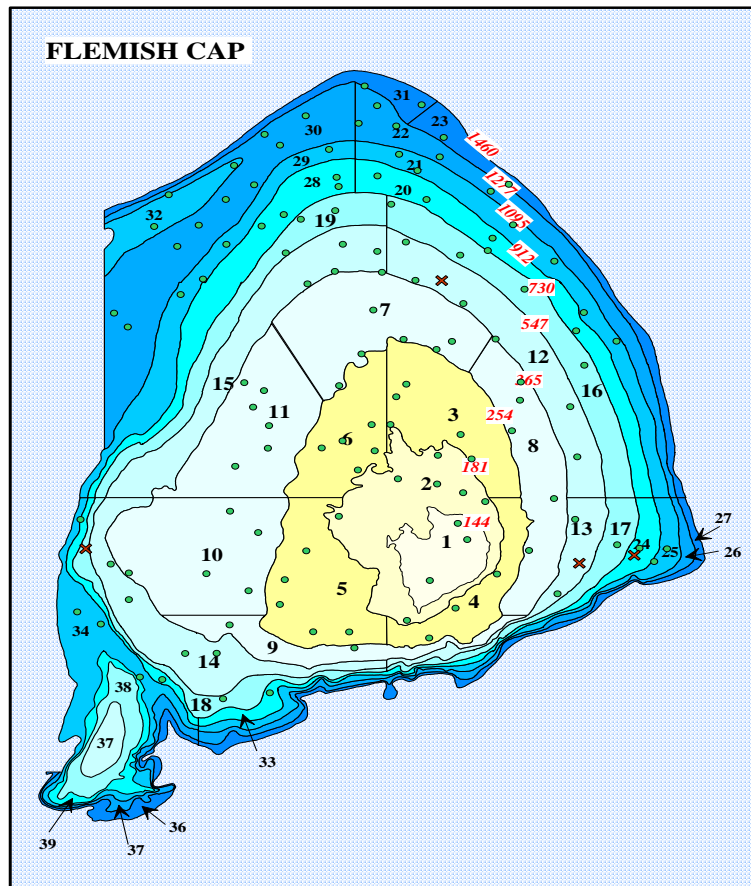
length	age																total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	
1																	
2																	
3																	
4																	
5		2	1														3
6		2	7	1													10
7		1	7	1													9
8			4	17													21
9			1	8	9												18
10				9	13	1											23
11				3	16	9											28
12					6	19	5										30
13					1	16	16										33
14						2	23	8	3								36
15						1	15	26	7								49
16							1	25	15	3							44
17								15	19	8	1						43
18								2	17	15	1	1					36
19									9	12	7	2	1	2			33
20									1	8	9	3	1		2		24
21										5	5	2	4	1			17
22										2	2	2	1	2			9
23												3	2	1	2		8
24												2	1				3
25																	
26													1				1
total		5	20	39	45	48	60	76	71	53	25	15	11	6	4		478

Table 31 – (continued)**FEMALE**

length	age																total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	
1																	
2																	
3																	
4		1															1
5		4															4
6		2	8														10
7			4	2													6
8			6	3													9
9			1	6	1												8
10				4	3												7
11					9	2											11
12					5	12	1										18
13						10	6	1									17
14						6	16	2									24
15						1	11	20									32
16							4	16	4								24
17								12	8	1							21
18								3	9	7	3						22
19								1	6	11							18
20									5	14	3	1					23
21									2	10	3	1					16
22									1	3	10	5	1				20
23										2	6	11	2	1			22
24											1	15	8	1	2		27
25											5	11	6	4	3		29
26												2	12	9	3	3	29
27											2	1	9	17	6	4	39
28												1	1	12	14	9	37
29													1	3	11	12	27
30														2	2	21	25
31														1	3	20	24
32														1		10	11
33														1		9	10
34														1		6	7
35																3	3
36																3	3
37																5	5
38																1	1
39																1	1
40																1	1
41																2	2
total		7	19	15	18	31	38	55	35	48	33	48	40	53	44	110	594

Table 32 - Roughhead grenadier (*Macrourus berglax*) abundance at age (thousands) in the 2011 survey.

age	n	mean weight (g)	mean length (cm)
1	35	3	3
2	120	13	5
3	310	35	7
4	459	67	9
5	540	116	11
6	726	176	12
7	948	247	14
8	1376	349	16
9	1140	458	17
10	1032	611	19
11	585	817	21
12	575	1043	23
13	461	1244	25
14	505	1582	27
15	398	1677	27
16+	936	2560	32
total	10145	7616	18.7

**Figure 1** - Haul positions for the Flemish Cap survey 2011.

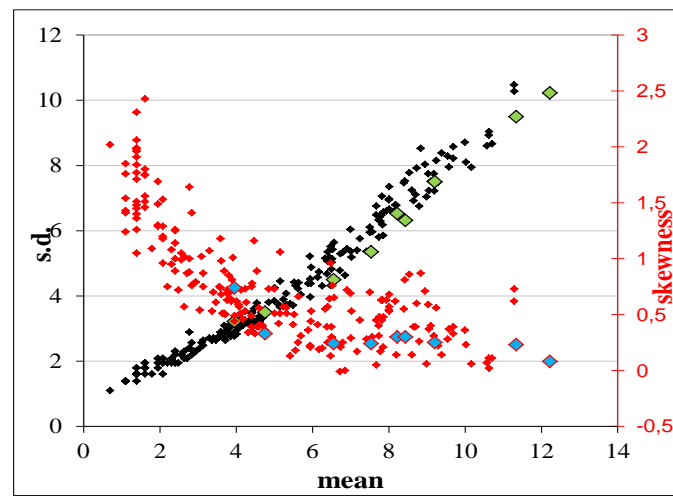


Figure 2 – Standard deviation (s.d.) and skewness g_1 statistics for estimates of cod abundance at age. Green and blue points are from 2011, while black and red ones are from 1988-2010.

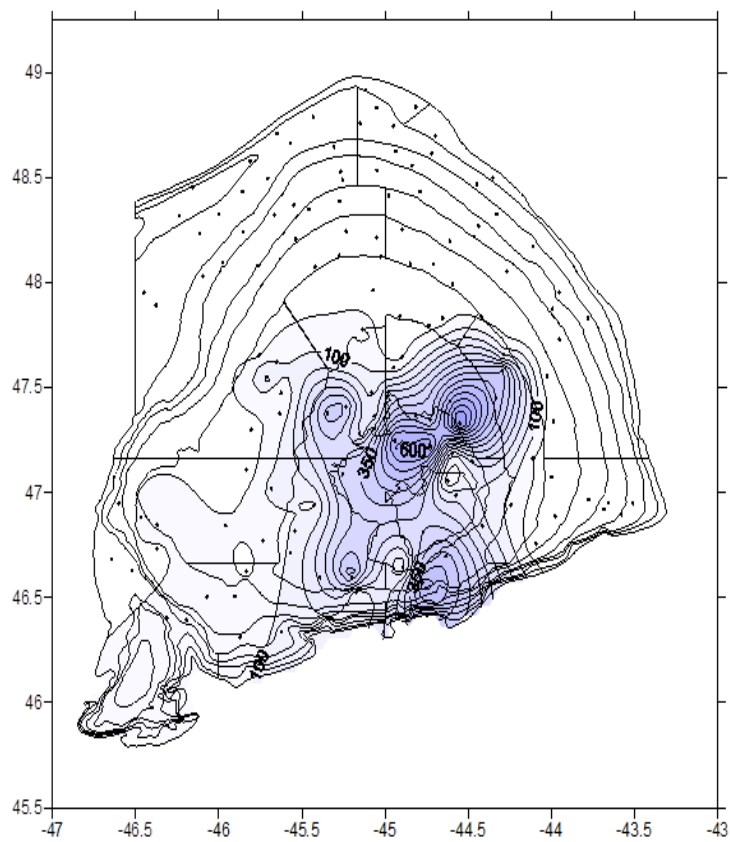


Figure 3 - Cod (*Gadus morhua*) catch distribution in the 2011 survey in kg.

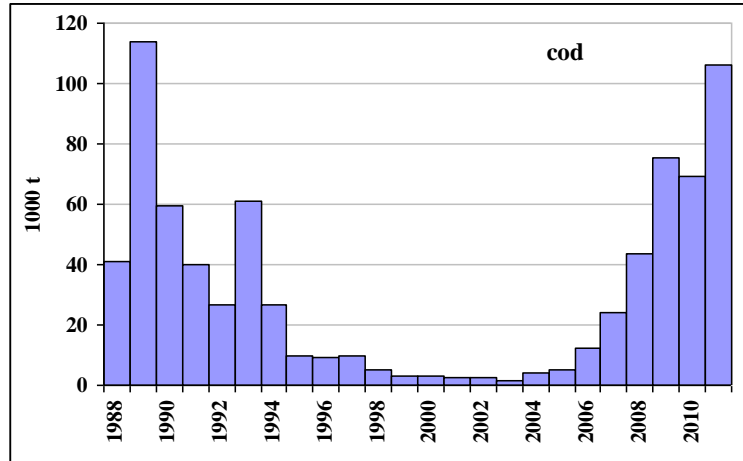


Figure 4 - Cod (*Gadus morhua*) survey biomass.

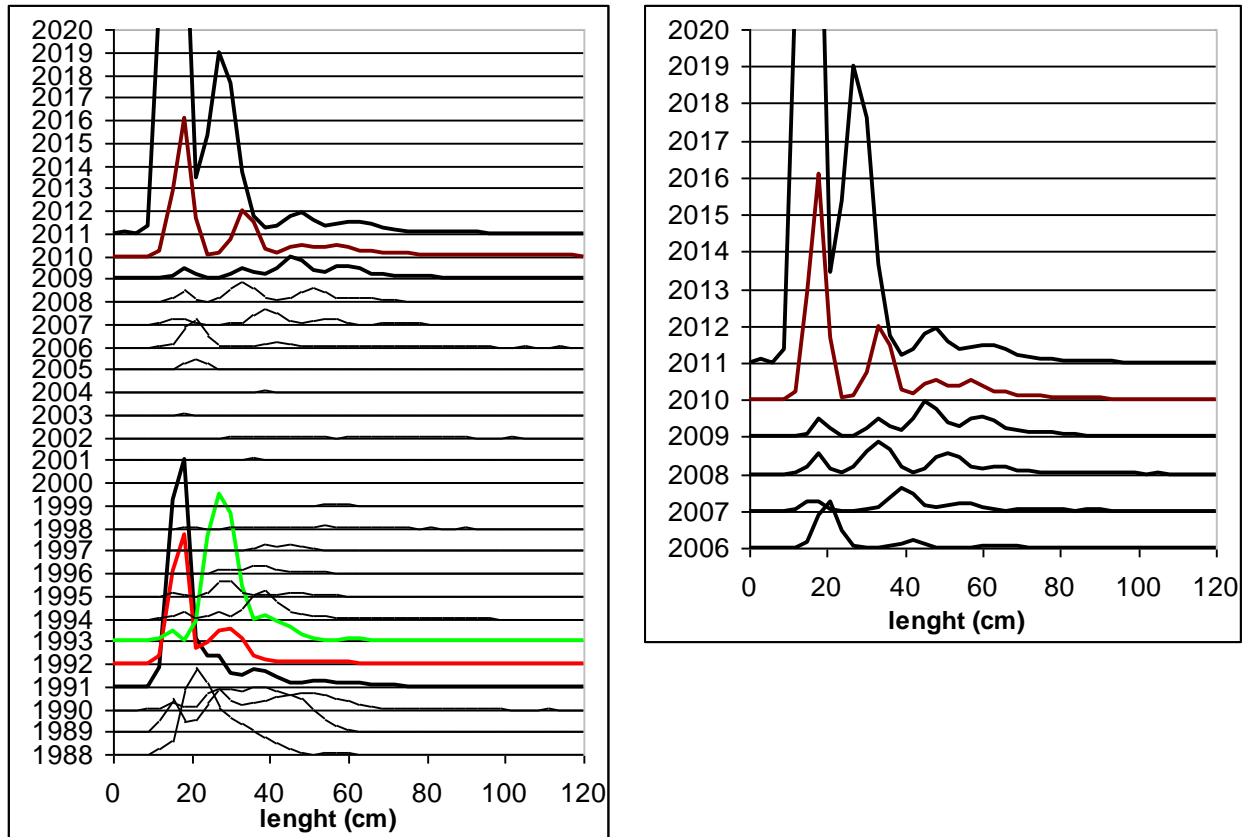


Figure 5 – Cod: length distribution along the survey series. Most recent years are repeated at the right side for better view. Stock in 2011 is clearly dominated by ages 1 and 2.

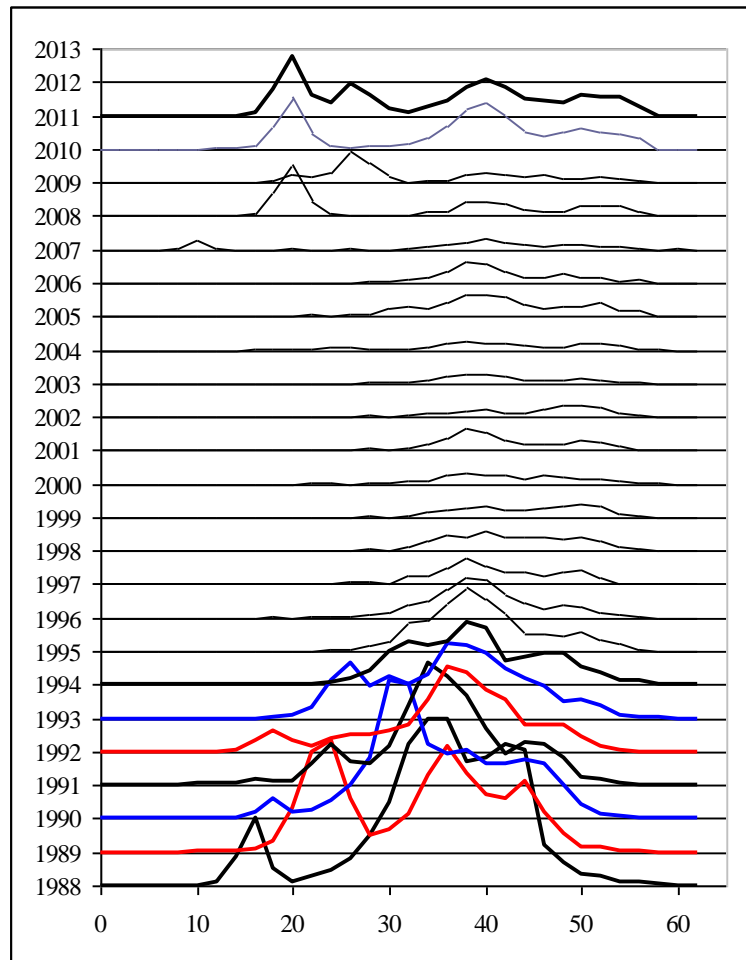


Figure 8 – American plaice: length distribution along the survey series.

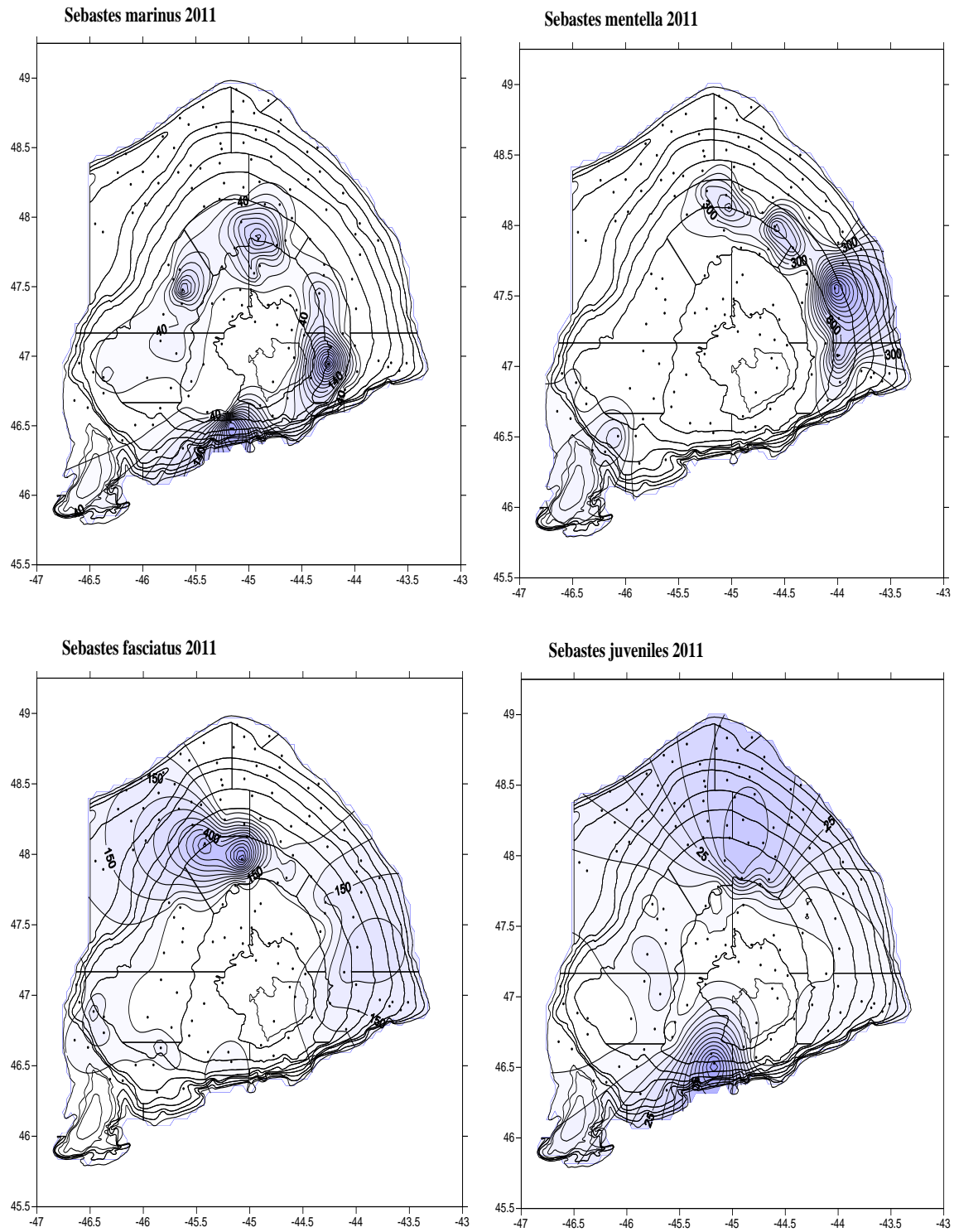


Figure 9 - Redfish catch distribution in the 2011 survey in kg.

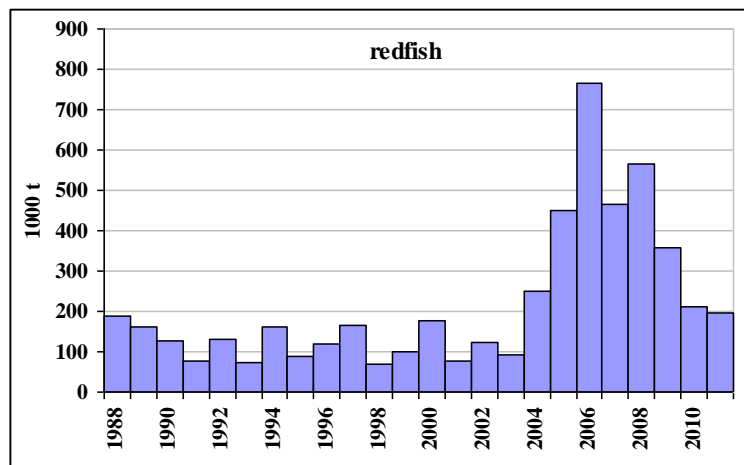


Figure 10 - Redfish survey biomass.

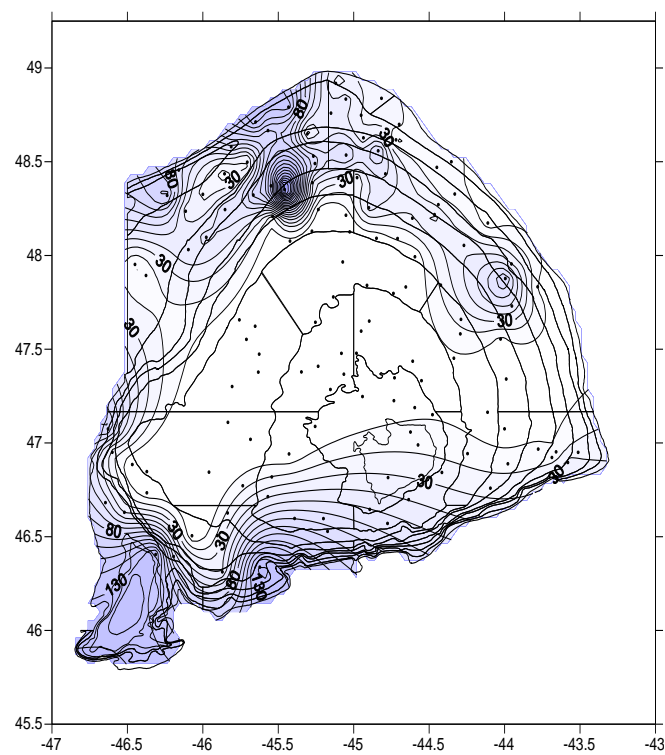


Figure 11 - Greenland halibut (*Reinhardtius hippoglossoides*) catch distribution in the 2011 survey in kg.

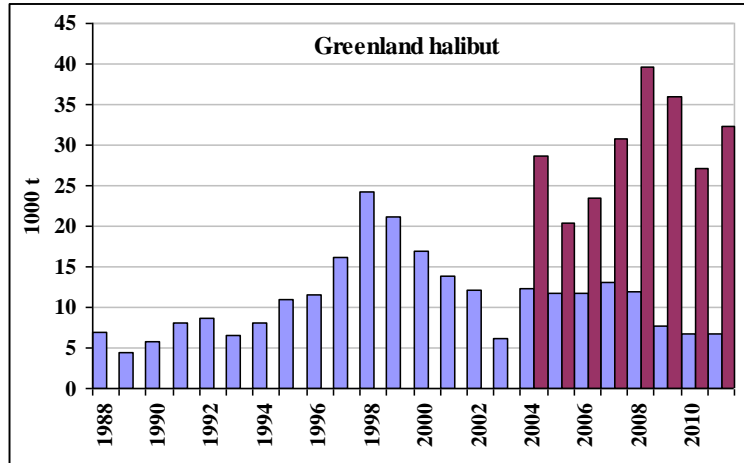


Figure 12 - Greenland halibut (*Reinhardtius hippoglossoides*) survey biomass up to 730 (blue) and up to 1460 m (red).

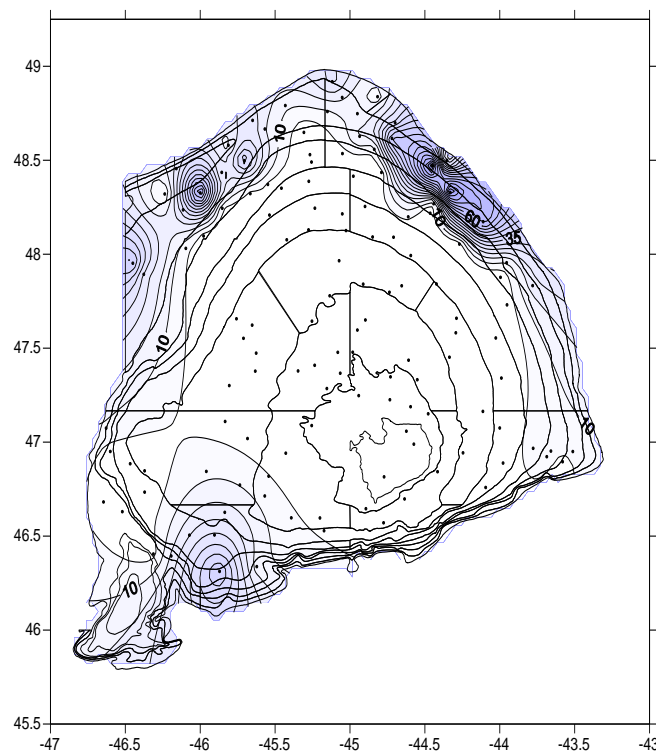


Figure 13 - Roughhead grenadier (*Macrourus berglax*) catch distribution in the 2011 survey in kg.

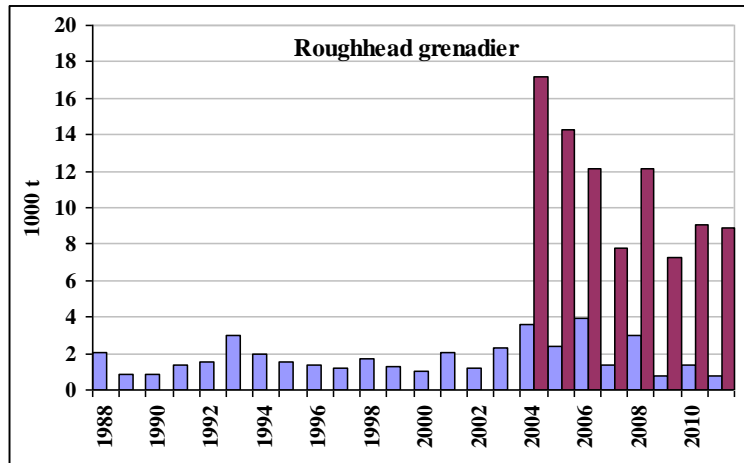


Figure 14 - Roughhead grenadier (*Macrourus berglax*) survey biomass up to 730 (blue) and up to 1460 m (red).